

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

BMT1814 –MANAGERIAL MATHEMATICS

(All sections / Groups)

16 OCTOBER 2019

9 a.m - 11 a.m

(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 7 **pages** including cover page and mathematical formulas with 4 **Questions** only.
2. Attempt **ALL** questions and write your answers in the Answer Booklet provided.
3. The candidate is allowed to use scientific calculators that are permitted to be used in the examination.

Question 1 (25 marks)

- (a) A bag manufacturer experiences fixed monthly costs of \$130,000 and variable costs of \$65 per standard model bag produced. The bags sell for \$100 each.
- (i) If C dollars is the cost from selling x bag, write down a formula which relates C to x . [3 marks]
- (ii) How many bags must be produces and sell each month to break-even? [3 marks]
- (iii) What is the total revenue at the point where its break-even? [2 marks]
- (b) Solve the following linear programming problem by using the method of corners.

$$\text{Minimize } C = 3x + 2y$$

$$\text{Subject to } 4x + y \geq 12$$

$$3x + 15y \geq 44$$

$$3x + 4y \geq 22$$

$$x \geq 0$$

$$y \geq 0$$

[17 marks]

Question 2 (25 marks)

- (a) An office jet printer with the price of \$2000 can be bought using hire purchase with a deposit of \$200 and the balance being financed at 12% simple interest over two years. Find the total amount paid for the computer. [5 marks]
- (b) A RM 50,000 loan is amortized by equal quarterly payments over 5 years. If interest is at rate of 7% compounded quarterly, find the quarterly payment. [6 marks]
- (c) Find the interest obtained over four years when \$35,000 is invested 8% per annum with interest compounding on a half yearly basis. [7 marks]

Continued...

- (d) Helmi plans to put \$500 per month into his retirement account until he retire 25 years from now. If the account earn interest at the rate of 6% per year compounded monthly, how much will Helmi have in his account at the time of his retirement?
- [7 marks]

Question 3 (25 marks)

- (a) Find the first and second order derivative of the following functions.

(i) $y = 5x^7 - 2x^5 + 3x^{-3} - 7$ [4 marks]

(ii) $y = x(4 - x)^2$ [5 marks]

(iii) $y = \frac{2+x^3+x^4}{x^2}$ [4 marks]

- (b) The total revenue (in dollars) for selling a product is given by the function of $R(x) = 250x - 0.7x^2$ where x is the number of units sold per day.

- (i) Find the number of units that must be sold to maximize the revenue. [5 marks]

- (ii) What is the maximum revenue? [1 mark]

- (c) For the following function: $f(x) = 6xy - 3y^2 + x^2 - 2x + y - 7$.

- (i) Find the first partial derivatives, $f_x(x, y)$ and $f_y(x, y)$. [4 marks]

- (ii) Compute $f_x(1, 0)$ and $f_y(-2, 4)$ [2 marks]

Continued...

Question 4 (25 marks)

(a) Integrate the following functions:

(i) $\int \left(\frac{-x^9 - 3x^6 - 7x}{x^3} \right) dx$ [4 marks]

(ii) $\int_{-2}^1 3x + 4x^{-8} + \frac{4}{x^2} dx$ [6 marks]

(b) Solve the following integral using integration by substitution:

$$\int_{-2}^1 (x - 3) dx + \int_1^2 \frac{9x^2}{(x^3 - 3)^2} dx$$

[8 marks]

(c) Find the area bounded by the graph $f(x) = x + 4x^2$, the x -axis and the line $x = 1$ to $x = 8$.

[7 marks]

End of Page.

Course: Managerial Mathematics

Code: BMT 1814

Summary of Principal Formulas and Terms

1. Quadratic Formula

The solution of the equation: $ax^2 + bx + c = 0$ where $a \neq 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

2. Equation of a Straight Line

- (i) Slope of a line, $m = \frac{y_2 - y_1}{x_2 - x_1}$
- (ii) Point-slope form, $y - y_1 = m(x - x_1)$
- (iii) Slope-intercept form, $y = mx + b$ (where m = slope, b = y-intercept)
- (iv) General form, $Ax + By + C = 0$

3. Simple Interest

- (i) Interest, $I = Prt$ (P = principal, r = interest rate, t = number of years)
- (ii) Accumulated amount, $A = P(1 + rt)$

4. Compound Interest

- (i) Accumulated amount, $A = P(1 + i)^n$, where $i = \frac{r}{m}$, and $n = mt$
(m = number of conversion periods per year)
- (ii) Present value for compound interest, $P = A(1 + i)^{-n}$

5. Effective Rate of Interest

$$r_{\text{eff}} = \left[1 + \frac{r}{m}\right]^m - 1$$

6. Future Value of an Annuity

$$S = R \left[\frac{(1 + i)^n - 1}{i} \right] \quad (S = \text{future value of ordinary annuity of } n \text{ payments of } R \text{ dollars periodic payment})$$

7. Present Value of an Annuity

$$P = R \left[\frac{1 - (1 + i)^{-n}}{i} \right] \quad (P = \text{present value of ordinary annuity of } n \text{ payments of } R \text{ dollars periodic payment})$$

8. Amortization Formula

$$R = \frac{Pi}{1 - (1+i)^{-n}} \quad (R = \text{periodic payment on a loan of } P \text{ dollars to be amortized over } n \text{ periods})$$

9. Sinking Fund Formula

$$R = \frac{Si}{(1+i)^n - 1} \quad (R = \text{periodic payment required to accumulate } S \text{ dollars over } n \text{ periods})$$

10. Basic Rules of Differentiation

- (a) Derivative of a constant: If $f(x)$ is a constant, then $f'(x) = 0$
- (b) Power rule: If $f(x)$ is x^n , then $f'(x) = nx^{n-1}$
- (c) Constant multiple rule: Derive $cf(x) = cf'(x)$ (c is a constant)
- (d) Sum rule: Derive $f(x) \pm g(x) = f'(x) \pm g'(x)$
- (e) Product rule: If $f(x) = u \times v$, then $f'(x) = u \frac{dv}{dx} + v \frac{du}{dx}$
- (f) Quotient rule: If $f(x) = \frac{u}{v}$, then $f'(x) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{[v]^2}$
- (g) Chain rule: Derive $g[f(x)] = g'[f(x)]f'(x)$
- (h) General power rule: Derive $[f(x)]^n = n[f(x)]^{n-1} f'(x)$
- (i) Exponential function: Derive $e^x = e^x$
Derive $(e^u) = e^u [u'(x)]$
- (j) Logarithmic function: Derive $\ln x = \frac{1}{x}$
Derive $(\ln u(x)) = \left(\frac{1}{u(x)} \right) [u'(x)]$

11. Basic Rules of Integration

- (a) Indefinite integral of a constant: $\int k \, du = ku + C$
- (b) Power rule: $\int u^n \, du = \frac{u^{n+1}}{n+1} + C$
- (c) Constant multiple rule: $\int k f(u) \, du = k \int f(u) \, du$ where k is a constant
- (d) Sum rule: $\int [f(u) \pm g(u)] \, du = \int f(u) \, du + \int g(u) \, du$
- (e) Exponential function: $\int e^u \, du = e^u + C$
- (f) Logarithmic function: $\int \left(\frac{1}{u} \right) \, du = \ln u + C$

12. Definite Integrals

a) The fundamental Theorem of Calculus:

Let f be continuous on $[a,b]$, then,

$$\int_a^b f(x) \, dx = F(b) - F(a) \text{ where } F \text{ is any antiderivative of } f; \text{ that is } F'(x) = f(x)$$

b) Area between two curves:

Let f and g be continuous functions such that $f(x) \geq g(x)$ on the interval $[a,b]$. Then the area of the region bounded on $[a,b]$ is given by $\int_a^b [f(x) - g(x)] \, dx$.

13. Determining Relative Extrema

$$D(x, y) = f_{xx}f_{yy} - (f_{xy})^2$$

If $D > 0$ and $f_{xx} > 0$, relative minimum point occurs at (x, y) .

If $D > 0$ and $f_{xx} < 0$, relative maximum point occurs at (x, y) .

If $D < 0$, (x, y) is neither maximum nor minimum.

If $D = 0$, the test is inconclusive.